JPRS 82104

28 October 1982

East Europe Report

SCIENTIFIC AFFAIRS

No. 758

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CONTENTS

OBJECTIVES IN BIOLOGIC, GENETIC RESEARCH

Sofia TRUD in Bulgarian 31 Aug 82 pp 1, 2

[Text] There has hardly been any other scientific field recently which has shown so clearly the connection between fundamental research and its practical application as genetic engineering. Fewer than 15 years have passed from the time when we began to speak about it and the unlimited possibilities which its methods would present to humanity. The research of the complex processes which are at its foundations is a subject of special interest to our scientists too.

Genetic engineering is not an independent scientific field; rather, it is a complex of methods built upon different sciences: chemistry, physics, mathematics, genetics, and molecular biology. In essence, it is the "breaking" (with the help of enzymes of the messenger ribonucleic acid (mRNA) in which process, this complex molecular compound is broken into fragments which opens the possibility for some fragments to "stick" to other, different ones. This is the way to achieve a new biologically active mRNA, and thus the idea about the possibility for the realization of the age-old dream of humanity to correct the heredity of organisms was born. In other words, man will be able to direct heredity!

Of course this is oversimplified, but we can speak about results and certain achievements in the field of genetic engineering on a world scale. For example, the production of insulin and somatotropine hormone from bacteria was helped by the methods of genetic engineering. The same thing happened with the samototropine hormone which helps the building up of biomass in animals and thus leads to an increase of meat production.

Bulgarian scientists from the institute for molecular biology at BAN, under the leadership of Corresponding member Professor Kalcho Markov, managed to construct a strain which produces great quantities of enterotoxins, indispensable for the experimenters. What is the significance of all this?

To explain it, we will remind you that in every human being there are colibacteria, who live there as normal inhabitants, but sometimes they produce toxic substances, called enterotoxins. For nurselings and little children, they create a real danger of severe illness. That is why medical science is trying to produce antibodies, as was done, for example, with the well known

serum for dephteria or snake poison. Unfortunately, the toxic colibacteria produce little enterotoxins and it is impossible to obtain the necessary quantity which is to be purified and sufficient for the creation of antibodies. What is to be done then?

Scientists managed to isolate the gene responsible for the production of enterotoxins and to introduce it in a carrier, the so called plasmid. In essence, it is an RNA molecule which can freely travel from cell to cell and multiplies independently from the multiplying of the cell. As a result, the new strain can produce, by its multiplying, 8 to 10 times more enterotoxins than the colibacteria. It is feasible that new strains, necessary for the creation of other serums, will soon be provided.

The problem of feeding the earth's population, which in 2,000 is expected to reach 6-7 billions, is of paramount importance. Today people speak more frequently about the energy crisis, but it is necessary to remember that 40 percent of the energy resources are spent on the productionof nitrogen fertilizers, so vital for agriculture. At the same time huge amounts of nitrogen remain unutilised in the atmosphere because, as it is well known, plants take their nitrogen from unorganic substances in the soil. Only certain microbes which live in the roots of some leguminous plants can absorb or "fix" the nitrogen from the air.

The problem is complex and very difficult to solve. Experts work in two directions. It seems that it is more realistic to transplant the nitrogen fixing genes from the microbes which live only around the roots of leguminous plants to other microbes which normally develop and live around the roots of other important crops like wheat and corn (there, they will absorb the nitrogen from the air and will enrich the roots with this element).

The other direction is even more fantastic--to transplant these genes directly in the plant! The solution in this case meets with great difficulties since photosynthesis takes place in plants and the oxygen produced in the process destroys the enzyme nitrogenic (the one which is instrumental for nitrogen absorption by microorganisms). However, there are ways for the realization of this almost unbelieveable possibility, and they lie in the genetic changes which will be caused in the plants (or in the microbes).

Scientists do not diminish the purposefulness and perseverance of their work in this very interesting area of biology. They are firmly convinced that the time when the "wonders" of science will come out of the test tube is not far away!

9804
CSO: 2202/20

STATUS OF COMPUTER PRODUCTION CRITICIZED

Prague RUDE PRAVO in Czech 30 Aug 82 p 5

[Article by Zdenek Kotalik, Research Institute of Mechanical Engineering Technology and Economics, Prague: "Following Our Neighbors' Example"]

[Text] Computer technology is one of the fields experiencing the greatest growth worldwide. It is an important fact, under our country's conditions, that it complies fully with the guidelines mapped out by the 16th CPCZ Congress regarding structural changes in production, namely a focus on nonmaterial-intensive production with a high skilled-labor content. It has another special feature. Deliveries of data processing equipment include not only hardware but the means of utilizing it: software, system aids and comprehensive computer utilization plans. This nonmaterial part of the deliveries actually accounts for more than half of the expense of acquiring a computer. There is a need to train capable people and create adequate working conditions for them.

The suitability of the computer field can be demonstrated by a few examples. ZPA [Machinery and Automation Plants] Kosire is producing paper-tape readers, which are peripheral equipment for computers. The devices weigh only 300 kg, but their prices on foreign markets are considerably higher than that of an ordinary automobile. A favorable balance is also provided by Aritma Prague's card-sort machines. Unfortunately we have only a few other types of equipment which would be successful on foreign markets. In contrast, other countries which began developing data processing equipment much later are having greater success in foreign competition: examples are Bulgaria and Hungary.

Reasons for the Shortages

The main reason is our underestimation of the demands of the data processing field, both in the past and at present. The fact that we belong to the small number of advanced countries which are capable of developing data processing equipment should not make us complacent. Our production is scattered and is of the on-off or small-series type. Most computers are produced by enterprises specializing in other fields, so that their production is of an ancillary nature, with low technical standards and inadequate equipment. Naturally this affects quality, costs and the possibility of incorporating the newest achievements of science and technology.

The field suffers from the lack of an adequate overall concept of development. The fact that we have no long-standing tradition of computer production is no excuse. It is precisely because we are really still just beginning that we should proceed in a carefully considered manner with long-range conceptions. Uneven development leads to undesirable duplication in production and an inability to supply a complete range of computers, other hardware and software.

This is the case, for example, in the production of minicomputers. ZPA Cakovice produces the ADT computers, Tesla Straznice the JPR computers, and Zavody vypocetny techniki [Data Processing Equipment Plants] in Bansko Bystrico the SM 3 and SM 4. The SPU 800 processor is also produced there, while the similar AK 10 is made at Aritma Prague. All of the producers turn out their products in small numbers and furnish products with an incomplete set of hardware and software.

Lack of a Full Range of Hardware

The limited overall scope of computer production, together with duplication in the production of mainframes of the same computing power, results in a lack of sufficient capacity for the production of peripherals. Computers are delivered only in the so-called "base configuration," with hollow assurances that the user will later be able to expand the computer to the desired configuration. An incompletely equipped computer can be used at most for experimental or testing work, but it ha- little potential for practical use.

Disk stores are currently the most acute problem area. Lack of coordination of their development and failure to carry out production and foreign deliveries are the main result of the several years' delay in the production of the 3.5 generation EC 1025 computer. For the most part the producers equip the minicomputers they well with one disk unit, although they are well aware that this incomplete configuration is not usable.

There is an almost complete lack of data collection equipment and terminals to connect computers with management locations. The problem is of many years' standing, even though everyone knows that without this equipment the effectiveness of computers in management is considerably lessened. No producers have come forward even though the wholesale prices of existing equipment, such as the terminals for the KA 10 computer and displays, are very attractive and these products are suitable export items.

Computer reliability is still an important problem. Even though it has improved considerably, the steps that have been taken cannot be considered sufficient.

Another reason is that computer malfunctions in the control of production and manufacturing processes may cause considerable loss. The situation is aggravated by a shortage of terminals and of communication and control components for automation equipment. These components are frequently replaced by equipment developed in-house, which increases the malfunction rates of the entire systems.

The unavailability of complete computer configurations and concern about their frequent malfunctions are making users cautious in selecting the roles to be turned over to computers. Frequently the criterion used is not the effectiveness of the role that the computer might play, but the question of what can be done by an incompletely configured computer and the question of how great a threat to operations is posed by computer malfunctions. Thus preference is given to roles which are not very critical or very important for supporting the functioning of the organization.

The Solution

We need not look far for a model. Our neighbor to the north, East Germany, has built a powerful, prosperous production base, which is has concentrated in one economic production unit with its own research base, industrial technology base and export organization.

We are clearly not capable of building such extensive capacities. Rather, we need a well-considered concept for the long-term development of the field. We must start with the recognition that we cannot develop and produce everything ourselves. Our means of dealing with this problem is our inclusion in the international division of labor among the CEMA countries. We must be actively involved, in keeping with our capabilities and needs, and our involvement must allow us to achieve mass production. It must lead to renovation of export capabilities in the field and thus produce foreign exchange for import of the equipment which we need to complement our own products and fill out the required selection.

The adoption and consistent implementation of such a concept must eliminate duplication in the development and production of computers and lead to the institution of new, considerably more stringent demands regarding the quality of data processing products. We must see to the expansion of organizational and technical assistance so that comprehensive service can be offered with deliveries and installation of computers and so that a high level of functional capability can be maintained and effective assistance in planning and programming for the equipment can be assured.

8480
CSO: 2402/71

PRODUCTION AT COMPUTER TECHNOLOGY PLANT DESCRIBED

Bratislava PRACA in Slovak 18 Sep 82 p 9

[Article by Juraj Sidorenko: "SMEP Is Born Here"; at Computer Manufacturer in Banska Bystrice]

[Text] When it is said that the Computer Technology Factories have been in Banska Bystrice since 1 January 1979, it is true--but not completely true.

"Because," explains their long-range technical development plan manager, Eng Josef Cuchran, "our enterprise has been here longer, but previously we belonged to Tesla. The objective of the change has been to create improved conditions for the development and application of computer technology by concentrating the research, production and delivery functions."

Previously, computer technology was being worked on by organizations and enterprises belonging to several VHJ [Economic Production Units]. As of January 1979, however, they were all placed under a single, umbrella concern organization, the Prague Automation and Computer Technology Plants.

"The concern includes three research institutes: the Zilina Computer Technology Institute, the Prague Mathematical Machines Research Institute, and the Prague Research Institute for Automated Equipment. Our firm, in conjunction with our factories in Namestovo, Rimavska Sobota and our separate operations in Hel'pa and Zelezna Breznice, cooperates closely with the Zilinia Computer Technology Institute in particular."

First was the SPU 800

The former Tesla factory at Banska Bystrice originally built equipment for the reception and selection of television and radio signals, telecommunications equipment, components and parts for the electrotechnical industry and, finally, information-processing equipment.

"And it is this last phase, which began to develop intensively here in the mid-seventies, that became the basis for what is now our central program and, to be sure, the reason that our factory is included among those involved in computer technology. Back in 1977-78 the first deliveries were made of the first, for its given area of application, the Czechoslovak microcomputer system,

"the SPU 800. Just as at the former Tesla factory in Namestovo, so today in our factory we have been producing the first minicomputer control system, the RPP 16."

On this basis, then, they have begun to build a new future. Now their main development and manufacturing program is in Sector 403--Information Processing Machinery. This equipment accounts for two-thirds of their output and this percentage is expected to increase, because the remaining three fields, hold-overs from the Tesla period, are not developing within the firm. All growth is concentrated in information processing and its supporting divisions.

For Control Automation

We will not go into the reasons why microelectronics have assumed such a priority position throughout the world. These reasons are known, convincing and are generally recognized. At the Banska Bystrice Computer Technology Plants concern enterprise and its factories, the above-mentioned two-thirds of total output devoted to computer technology is represented this year primarily by the SM 3/20, SM 4/20, and SPU 800 minicomputer systems and by several types of peripheral equipment.

We have said that these factories cooperate closely with the Zilina Computer Technology Research Institute. This institute is the center for research and development of the SMEP micro- and minicomputers (System of Small Electronic Computers), while the factories will handle the production. They are now producing the equipment for the initial SMEP series, the SM 3/20 and SM 4/20, which were mentioned above.

"These machines are used primarily in ASR, automated control systems for technical processes, for enterprises, in the field of scientific calculations, and in the automation of design and construction work.

"The future development of the SMEP mini- and microcomputers will be undertaken in conjunction with the Technical Cybernetics Institute of the Slovak Academy of Sciences in Bratislava as well as with the following, mainly college level facilities: the Electrotechnical Faculty at the Slovak Institute of Technology in Bratislava, the Kosice Institute of Technology, and the Czech Institute of Technology in Prague."

Expanding Applications

"The SMEP I is already being succeeded by the SMEP II, which will be compatible with the first system both in terms of technology and in terms of software.

"The SMEP II series includes the production of new equipment: the SM 50/40-1 and the SM 50/50 microcomputer systems, the SM 52/11 advanced minicomputer system, and the SM 53/10 distributed, multicomputer system.

"This implies an expansion of applications, mainly into the field of technical process-control. Microcomputers will be used here not only to control

"entire systems but also individual machines or smaller technology, industrial robots and handling equipment. (Regarding the latter we are in close contact with the Metal Industry Research Institute, VUKOV in Presov, which is coordinating the development of our robots and handling equipment.) By the same token, however, this computer technology may be applied to the preparation, processing and transmission of data."

Production of the SM 50/40-1 will begin this year, and next year production will begin on the remaining members of the SMEP series.

Work is Proceeding on SMEP III

It is essential, however, to think much further ahead than a single year, to the end of the 5-year plan. Attention must rather be directed to the upcoming 5-year plan, and therefore the SMEP III series is already being prepared by the professional research and development base. This is a matter of designing of mini- and microcomputer systems which will be used at various levels of control and automation, but primarily in those areas where their introduction will produce the most significant technicoeconomic impact. These fields include the machinery industry, with consequences for the fuel and energy sphere, agriculture, as well as chemistry, health care and other sectors. Research and development work is to take place in the current 5-year plan, with production and installation planned for the next 5-year plan.

Peripherals as Well

However, their development program in Sector 403 includes not only the systems themselves, but also selected types of peripheral equipment for the SMEP and the JSEP (Uniform System of Electronic Computers). The CEMA produces computers of this series in our country primarily at the Cakovice Machinery and Automation Plants, which in turn are part of the Automation and Computer Technology Plants concern enterprise. This series is made up of larger computers designed for the processing of large volumes of data.

"Peripheral types of equipment we are currently producing include the EC 7934-00.01 electronic printer, the EC 7925 display for the Czechoslovak EC 1026 computer for export to the USSR, display units for the SPU 800 system, and mode modems for data transmission (the word modem is an acronym composed of the first letters of the words modulator and demodulator and is a piece of equipment that modifies signals so that data may be transmitted by a unified telecommunications system). We are also producing PAS 465 input units which convert graphic representations into electrical signals. This is the current situation, and by way of explanation one should add that the units designated by the letters EC belong to the JSEP series, and those designated with SM belong to the SMEP series. In developing our products for the JSEP series we are primarily in contact with the Research Institute for Mathematical Machinery which is focusing its work on the scientific and technical development for the JSEP program."

Future plans for the development of peripheral equipment at the Banska Bystrice Computer Technology Factories include the further development of displays

(graphic, black and white, and color), work station terminals based on the SMEP microcomputers, external memory based on magnetic media for mini- and microcomputers, and keyboards.

Construction Components

The production of construction elements is also being developed at plants of Sector 374, Construction Components for the Electronics Industry. This includes the production of printed circuits with the possible transition to multiwire communications and the production of microswitches. There is also Sector 373, Associated Microelectronic Components. This heading includes the ongoing and expanding production of hybrid integrated circuits of simple structure with a gradual transition to integrated microprocessor structures.

"This extensive change in the production program of the firm also influences the technology of production processes, especially in the area of the reconditioning and testing of used components, but primarily in the testing of the computer equipment which is being produced. Even this testing apparatus is controlled today by mini- and microcomputers. And we are also producing some of this equipment for other users, and this part of our production will also grow."

The Component Base

And finally, we asked Eng Josef Cuchran, who is responsible for long-range technical development planning at our single producer of the SMEP mini- and microcomputers, to what extent they are capable of covering the needs of our national economy for their products.

"We have the production capacity to satisfy them fully. It is true, though that this production is limited by the availability of peripheral equipment, imports of certain components from foreign currency areas and, over the longer term, also by the degree of rationalization and modernization of production technology."

And how successful are we being in approaching the standards of state-of-the-art production worldwide?

"If we are to produce state-of-the-art final products, we must have at our disposal components with this level of technical sophistication and price. As far as function is concerned, we are able to manufacture good equipment, but it is heavier, uses more energy, takes up more space and requires greater amounts of service. And since we are concerned with conserving materials, energy and people, all of the above must be evaluated negatively. This follows from the criteria for evaluating the technical sophistication of products, which determines possibilities for export. Moreover, the sophistication of the component and material base available to us for computer technology also exerts a fundamental influence on this. We must, therefore, import certain components even though we are attempting gradually to reduce imports to the lowest possible level. We must consider it a success that under these conditions the technical sophistication of the SM 3/20 and the SM 4/20 minicomputers has been recognized. We are now trying to win recognition of the technical sophistication of the equipment we will begin producing this year and next."

9276
CSO: 2402/72

HIGHLIGHTS OF ACADEMY RESEARCH FROM 1976-1980

Budapest MAGYAR TUDOMANY in Hungarian No 6, Jun 82 pp 441-462

[Article by Lenard Pal, first secretary of the Hungarian Academy of Sciences (MTA): "About the Academy's Research in Recent Years, 1976 to 1980"*]

[Text] Introductory Thoughts

An old and honorable tradition in our academy is that every 5 years the general secretary delivers to the general meeting a comprehensive review of the state of the academy's scientific research and acknowledges the work of the research centers cooperating in practicing the various scientific branches. However, these acknowledgments worded with precise care and the mild and circumspect criticisms heard once in a great while--understandably--generally leave only quickly fading impressions in the audience, particularly in those removed from the particular specialized area. Because of their necessary brevity, these acknowledgments cannot actually characterize the achievements.

Here, at the highest forum of our academy, it is justified to hold an exchange of ideas with a broader outlook concerning implemented or missed opportunities, results and shortcomings. We cannot isolate our work from the social, economic and cultural processes of the present era; we can study our work only in that context, while analyzing the multifaceted manifestations of the mutual effects. It used to be said that generally the past is worth dealing with only to the extent necessary to help judge more accurately the present, and to outline more carefully the tasks of the future. There is great truth in this but perhaps more is involved here: continuity and definition, to which the key of understanding is provided by examination of the past.

Looking at the past 5 years I would like to concentrate my remarks on the following issues--without aiming at completeness:

--How good was the contact between academic research and the domestic socioeconomic reality?

--What results were produced?

*We are publishing the full text of the general secretary's report. At the 7 May closed session of the general meeting, this report was delivered in an abbreviated form.

--How much did academic research cost?

--How well did we make use of the opportunities in international sharing of the work?

--How well did we direct the research effort?

Obviously my answers will be one-sided. I hope that the debate will provide a significant contribution to help us see the main characteristics of the recent era's work from more angles. This in turn will certainly help draw the right conclusions for future tasks.

Before I turn to the individual issues, I would like to call attention to a few well-known facts. The world economic crisis further deepened from 1975 to 1980; the unfavorable tendencies, which could even be seen from the experiences of earlier years, gained strength. The thawing process in world politics has stalled. A situation that in many respects requires new initiatives in order for a new thawing process to develop has developed.

The unfavorable tendencies in the domestic economy also gained strength during this period. Domestic consumption of the national income did not exceed the development of resources by the desirable margin. The foreign trade deficit increased. Based on the December 1978 resolution of the MSZMP Central Committee, it became necessary to look for and develop new paths of growth, taking care that domestic consumption increase more moderately than the national income, that the foreign trade balance improve and that simultaneously the average standard of living should not deteriorate.

It is well known that in 1977 the Politburo reviewed the experiences of implementing the scientific policy guidelines. It concluded that even though the effect of the guidelines is recognized in the basic processes, significant shortcomings can be seen in a number of important areas. We did not succeed in significantly concentrating the intellectual and financial resources on the most important tasks and we did not succeed in identifying the research areas to be increased or cut back. Critical evaluation of the scientific performances is insufficient, joint interest of the researchers and users in the utilization of research results has not developed, etc. The resolution paid much attention to the factors that promote and hinder society's use of the results of science and technological development, since the analyses showed that progress was slower than desirable in this area and unfortunately slower than possible. The resolution concluded, for example, that some production organizations are still afraid of the risk associated with the introduction of the scientific results.

What Were We Doing?

It is not easy to answer the question of how academic research reacted to the experienced and expected changes in the socioeconomic reality and to what extent it successfully implemented those social and economic priorities in the modification of the plans, which were worded more and more strongly through this period. Essentially, even though the scientific research and direction did react to the changes, unfortunately it did so timidly and with significant

inertia. This general opinion does not mean that there were no noteworthy and successful initiatives in some areas; it merely indicates that these initiatives did not become general. When I speak about the academy's research, I am referring not only to research conducted in the research institutions but also to research conducted in universities aided by the academy and other research conducted in other frameworks.

Among these good examples several social science research projects began; these were initiated primarily by the changed circumstances. Among these, it is worth mentioning the research projects dealing with:

--the problems of transition to intensive reproduction;

--the role of domestic natural resources in shaping the production structure over the long range; and

--comparative analysis of the economic growth indexes of the CEMA countries.

The National Long-Range Scientific Research Plan was also expanded with three new main directions in the late 1970's under the effect of the changed circumstances. These main directions are:

--"Establishing scientific basis for the further development of our economic policy";

--"Comprehensive scientific study of the country's natural energy resources"; and

--"Development of social structure, life style and conscience in Hungary."

The natural science and technological research institutions also endeavored to have the priorities demanded by the new situation prevail in their research tasks. Such initiatives appeared in the larger research institutions as well as in the smaller research facilities. In the second half of the last 5-year period the goals reinforcing the technological-economic orientation began to have an increasingly vigorous effect in the academy's research.

The research facilities paid increased attention to

--development of scientific foundations of technologies that serve to decrease the specific energy and raw material requirements;

--the methods serving economical production, quality improvements and rational consumption of the basic and structural materials;

--advancement of automation and computerization;

--strengthening of the scientific background of the food industry; and

--the scientific foundations of further development of the economic policy and of preparing the comprehensive political and national decisions.

improvement could be seen in use of research results in the national economy but unfortunately a breakthrough did not occur--due to the combined effect of several circumstances. A number of important results will be recorded in the history of Hungarian technological progress as missed opportunities. For example, the Hungarian result in the production of leaf-protein was not successfully converted to economic profit. Even the Soviet Union finally contracted with the Alfa-Laval firm, not with a Hungarian enterprise, for the delivery of a leaf-protein plant. The magnetic bubble memory, developed in this country, did not find its way to the users; its technological level has even provoked Mr Carlucci, the U.S. deputy secretary of defense, to make unfounded charges against a noted Hungarian researcher. Our researchers have developed the production technology of some special materials (single crystals) important in electronics; unfortunately no entrepreneurs have been found to produce these materials. Utilization of several innovations in laser technology also did not take place; several potential pharmaceuticals and active agents for plant protection chemicals did not get beyond the laboratories.

Much has been written and much debate has taken place in the country about the utilization of technological and scientific results. Depending on where the debate took place, sometimes the research and development sphere and sometimes the production and sales organizations were blamed. However, if we carefully evaluate the experience gained in the last 5 years, we can conclude that the unfavorable phenomena were not caused by chance and generally not by subjective ill will. The unfavorable phenomena appeared more or less as the logical consequence of that system of conditions into which the research-development and production-sales organizations were embedded and in which they were forced to conduct their activities. Without going into the details, I would like to note only this much: experience shows that conditions that reflect the real value and interest relationships favor the utilization of research results more than do blaming and directive-issuing. Even with favorable conditions Hungarian-sized production and sales organizations alone cannot accept the full risk of introducing results that promise profits only over the long range.

It is well known that the social, economic and other effects of scientific results do not appear immediately. Therefore the effects from research between 1976 and 1980 and the consequences of initiatives and undertakings can be reported meritoriously also only after a few years.

However, according to our studies in the period under discussion the majority of the academy's research locations tried to react correctly to the changed circumstances. The information as well as the business contacts with the enterprises became livelier and stronger; the activity of the research locations increased in quickly and effectively transfering the specialized knowledge and advanced training of the professionals and in spreading the scientific methods and way of thinking. Planning became more flexible and adaptive. Several research centers carried out significant modifications in their research plans in the interest of satisfying the new needs. In a word, the connection between scientific research and social reality became stronger.

However, by listing these favorable facts I do not intend to weaken the conclusion that in the economically better years of the 1970's we did not succeed

in taking significant steps in social respects to break down the dividing walls between research and development, and production and sales, or to promote acceleration of innovation and technological growth. Thus, this task carried over to the first half of the 1980's. A situation has developed in which the domestic research policy has to face two requirements at the same time. On the one hand, it must vigorously develop the innovations that bring actual economic profit; on the other hand, it must intensively support the basic research projects that provide the new scientific information, under much more unfavorable economic circumstances than before.

Actually we started to solve the first part of this dual task in 1978, when development of the medium-range research and development plans began on the basis of the Politburo's resolution. The bodies and institutions of the Hungarian Academy of Sciences did their share of this work; it is no exaggeration to interpret this as correctly reacting to the changed circumstances.

For a few years the work on the medium-range research and development programs, which also included the need of practical realization, appeared to divert attention from the basic research projects, from development work that serves the more distant future, even though neither the people working on them nor the ones directing the work had such intentions. To the contrary, state and party resolutions called special attention to the importance of basic research. But in the early 1980's it again became necessary to clarify that even a small country like ours has an absolute need for high-quality basic research that produces new information, if the country wants to stand its ground in international competition.

The expenses of basic research activity between 1976 and 1980 amounted to about 47 percent of the academy's total research expenses, in contrast with 53 percent in the previous period. These numbers are not accurate but illustrate the tendency well. Actually it is not even so much the approximately 6 percent decrease that causes concern, as the deterioration of those financial conditions necessary to basic research. Because of the insufficient budgetary resources in the last time period, regrettably the financial supply to basic research has deteriorated, which in turn limited exploitation of the intellectual potential.

The conclusion can be drawn from the international trends and processes that during the 1980's the countries of the world--including our country--will need qualitatively new results in order to find the new growth paths, to create the means indispensable to build up these new paths, to avoid or limit those unfavorable effects that may occur as unforeseen consequences of past growth.

Everything indicates that the present characteristics make it necessary to increase support to high-quality basic research, which creates new things, since it will be possible to fend off a number of unfavorable effects only if we intervene on time, with the appropriate scientific thoroughness and with new methods in the processes that cause them. Basic research provides the basis for this. Domestic scientific opinion has several times expressed its desire to increase the share for successful basic research of the sums planned for research and development.

I would like to speak separately about some general characteristics of the activities of the social science research facilities, about the nature of their reacting ability produced by the socioeconomic reality. Differences can be seen between the individual specialty areas in the success of the activity as well as as in the nature of the reacting ability. For example, our researchers have unquestionably achieved outstanding results recognized not only by our country but also all over the world in research areas in economics, world economy, sociology, history, psychology, etc., even though the intensity of dealing with the questions presented by practical life was not free of fluctuations even in these areas with outstanding research results. In some scientific areas a certain reserve was seen from the present problems of reality [sic]. Of course, we must value highly all scientific production, regardless of whether its results can be utilized directly; this conclusion is valid also for the research projects of social science. However, if in some areas withdrawing from the socioeconomic priorities or contrasting these priorities with the requirements of being scientific becomes noticeable, then by all means this presents a reason for concern; this behavior indicates a failure to recognize something important, or perhaps a conscious refusal to accept it. Unfortunately such behavior can be experienced at times in almost all research facilities, including the non-social science research facilities; this often manifests itself in the demand that the authorizing parties provide additional manpower and additional financial support for the new assignments. Often the idea that the new assignments should replace some unsuccessful old research project does not occur to anyone.

As a result of many debates the situation has recently become more favorable. The social scientific research programs developed for the duration of the Sixth Five-Year Plan indicate that the coolness toward the priorities and practical tasks directly aiding the state's work are ending. The selected research tasks and priorities may also be initiated, and indeed should be initiated, by scientists and not only by the directing organs, since a multifaceted approach is needed in recognizing the needs and in outlining the directions of action.

The efforts of scientific research to find its direction and to renew itself were greatly helped by one of the most significant scientific policy declarations of the last 25 years about the freedom of scientific research. This created in our country an atmosphere in which nobody has to hide his scientifically well-founded reasons under a bushel and nobody has to be cautious in debates. For a long time this has been not just a declaration but a reality felt by everyone; there are no prohibited topics and there are no required conclusions for real scientific examination, reliance on scientific results has become the basic interest of politics and confidence and creative dialogue characterize the relationship between politics and science. I would like to quote the words of Comrade Janos Kadar, spoken at last November's exapnded presidium session of the academy: "In accordance with the past practice of the Central Committee, it will not take it upon itself to decide scientific debates in the future, either. If we deviated from this, it would be harmful and wrong in our opinion. Scientific problems must be cleared up and decided within scientific circles and by the debate of scientists." Without fear we can put before our critical opponents this practice of the freedom of scientific research as an example.

What Is the Result?

It is at least as difficult to answer this question as to answer how much this result has cost us. Listing the numbers would not say much. As a starting point, perhaps we still must accept qualifying the results of scientific primarily on the basis of analyzing those complex effects that these results precipitate in the various spheres of social existence. In this manner then, if we say that the object of evaluation is the effect precipitated by the results, we are probably focusing on the essence. That is, it can hardly be stated that there are scientific results that for a long time do not precipitate any effects at all. Even though there have been instances in the history of science when the true effect of a certain result developed only belatedly (I could also give such examples from physics), no example exists for a true result that precipitated no effect at all.

Where and how can we look for these effects? Naturally we can look in the most diverse spheres and with the most diverse methods. For example, in the case of basic research projects in the natural sciences these effects appear primarily in international value judgments and in the reactions of the scientific opinion. Naturally there are many other effects of the results of basic research. They contribute to the enrichment of culture and to the improvement of scientific thinking; they also exert their influence in education and indirectly in the economy. In the final analysis, many factors need to be weighed in the evaluation.

The effects of research aimed at economic goals would be obviously pratical to characterize by the economic profit that these research projects--directly or indirectly-- produced. However, one must be wary of oversimplifications; unfortunately some kind of direct and simple relationship between the research expenditures and the economic profit precipitated by them does not exist. In the complicated system of mutual effects, the various effects that significantly influence the economic result often overlap and compensate each other. Therefore it is almost hopeless to separate the direct effects of research results in the profit from other effects.

With a certain amount of arbitrariness we can list the effects of results of scientific research basically into three categories. The first is the category of scientific informative effect. This category includes those effects that represent the expansion and spreading of our scientific knowledge formed about nature and society or that initiate new scientific theories and result in the modernization of education and thus in the advancement of general culture.

The second category is social effect. Those effects are related to the fact that the scientific results may develop various forms of social reaction, may exert influence on the political, ideological, legal, administrative, cultural and other spheres; and--even though they generally do not result in direct profit or economic advantage--indirectly may have a fundamental effect on the economic sphere.

The third category is economic effect. These results on the macro level affect the way the nation's income develops and on the meso and micro levels, the

profitability of the national economy's branches, subbranches and enterprises. These effects directly or indirectly influence the standard of living and the condition of the nation's well-being.

In all three categories the indirect effect of scientific methods is important in the most diverse areas of practical activity.

We must see clearly that the majority of the effects of the academy's research results surfacing in the second half of the 1970's are the consequences of research projects started much earlier. Generally more than 5 years passes from the conception of an idea and the decision following it until the actual result and the effects. When we introduce the results of a given time period, we are qualifying the initiatives and decisions of a much earlier time. We must examine and judge the effects only with consideration given to this important reservation.

First I would like to consider briefly how international scientific opinion reacted to the Hungarian results. We can obtain data about these reactions and about the informative effects of the research results the easiest and most easily reviewed manner from the international scientific literature. The analysis of the data and the appropriate conclusions are an internal matter of our academy, since Comrade Kadar justly observed in November last year, at the meeting of the academy's presidium, that the primary interest of our people is not whether we write good or bad articles about scientific research but rather what profits the research produced, the end product. However, in order to shape our self-esteem and our correct sense of proportions, but mainly to improve the quality of our work, it is not unnecessary for us to examine the impressions reflected by the international scientific opinion about our basic research results. We have performed the studies, relying on the data base of the Institute for Scientific Information, Science Citation Index. Since this data base does not contain data on articles published in social science publications--and even if it did, we could not use it as our basis, in the present phase, due to the lack of other, suitable data base--we were unable to extend our studies to cover the social sciences.

In order to avoid misunderstandings, I would like to emphasize that scientific results can be evaluated from several other important viewpoints in addition to the information-communication projection. In the following we will restrict ourselves first to analyzing publication activity; by doing so we do not want in any way to decrease the importance of the other viewpoints. The analyses based on various models are not competitors but mutually complementary components of each other.

The importance of analyzing publication activity is supported by the circumstance that the informational effect--that is, the extent to which the published information is used in achieving further new scientific results, and by these means the extent to which the international scientific public opinion recognizes and accepts it--has special significance in judging the quality of the research.

The new research results that promise large economic profits or are able to influence significantly the growth of military technology are not published anywhere, even though in many cases these are the ones that lead to significant

breakthroughs. At the same time, wherever such results are produced, basic research is generally also conducted and produces outstanding results, which when published indicate the general standards of the work.

After this, let's see the facts. From the quoted data base, from 1976 to 1980, 13,584 Hungarian articles were published in those magazines covered by the Science Citation Index. Of the approximately 8,100 articles published during this period by the MTA's research facilities, 3,360 (42 percent) can be found in the data base of the Science Citation Index, or 24.7 percent of the total domestic production. This is not a bad percentage if we consider that the share of the academy's research from the domestic financial resources is significantly smaller (12.3 percent).

In the interest of examining Hungarian data not by just themselves, we have selected seven countries and compared the domestic index numbers with the appropriately weighed index numbers of these countries. The selected countries were: Czechoslovakia, Poland, Austria, Finland, New Zealand, Israel and the FRG. Reasons can be given for the selection but not explanations acceptable to everyone. Therefore let us also consider the selection an experiment, just as we consider the entire comparative examination an experiment. By the way, the publication productivities of the first six countries listed are comparable with Hungary's, while that of the FRG (Hungary's largest capitalist trading partner) is a full order of magnitude larger.

Naturally we made the comparisons of the indexes formed from the national data, since there would not have been anything with which to compare the separate data of the academy. The conclusions--with certain restrictions--are valid also for the informational effects of the academy's research, or at least we committed no major errors in assuming them to be valid.

Characteristically for the distribution by specialty area of the Hungarian publications published in the last 5 years and found in the data base of the Science Citation Index, together with Czechoslovakia and Poland the share of the chemistry is outstandingly high (around 20 percent), while the clinical medical science's share is low compared to the other four countries. It is conspicuous, however, that the ratio of medical biological publications is highest in Hungary among the countries examined; this, however, is not accompanied by outstanding values of the quality indexes.

The studies show that between 1976 and 1980 the Hungarian researchers generally published or were able to publish their articles in magazines with low informative effects, with a low expectation of the articles being quoted. Among the countries studied, the Hungarian researchers published in the magazines with the lowest quotation rates in the chemical, biological and medical biological specialty areas. It is no consolation that this holds true for the researchers of either Czechoslovakia or Poland in other specialty areas. Based on this fact it seems justified to review publication channels and to initiate the use of magazines that provide greater informative effect.

The next, even more important, question is, How good was the actual informative effect of the articles published? Did actual quotation approach expected

quotation? In the countries studied, actual quotation is about 60 to 70 percent of the expected quotation, unfortunately Hungary with its approximately 60 percent is last.

The picture becomes more detailed if we conduct the comparison separately in the individual specialty areas. We find differences that can be evaluated well. In biology and mathematics the actual quotation of Hungarian publications supersedes the expected value but in the clinical medical sciences and geological sciences it falls significantly short of the expected value. However, with the exception of these specialty areas Hungary is near the end of the ranking indicating expected quotation (and is at the very end considering all the specialty areas taken together). It is easy this way to surpass the expected value.

Simplifying it, we can conclude that while the level of our research results (to the extent this can be judged on the basis of quotation) is average by international standards, the quality of publication channels used to publish the results is generally unsatisfactory.

I do not want to stretch the introduction of quality characteristics of the domestic publications. But on the basis of these studies, I would like to make a few more conclusions.

The effect of the Hungarian publications that can be measured by quotation is distributed relatively evenly in the chemical and physical specialty areas among the publications, which means that the quality of the publications is good on the average also. But in the other areas a relatively small "seed" raises the average quotation near or above the expected value. In this respect the Hungarian medical biology stands out. Among the seven countries, in absolute terms Hungary had the most medical biological publications but the overwhelming majority of them remain unquoted. Similar lack of proportion is seen with Polish technical and mathematical sciences.

The other conclusion concerns the frequency of outstanding effects. If an article is quoted nine or more times in one year, it indicates that the scientific opinion is showing significantly greater than average interest toward the work in question. Finland and Israel stand out among the countries examined with their relatively high numbers of much quoted articles. Hungary with its 0.45 percent ratio is almost on the same level with Austria and New Zealand and ahead of Czechoslovakia and Poland. In Hungary most of the high-effect articles came from medical biology, proving the cited high degree of qualitative polarization of this specialty area.

A number of critical observations, or at least reservations, can be made for the structure of the data base used in the studies and for the expected quotation indexes of the magazines. There is no opportunity to show these now but some general conclusions can be drawn about the Hungarian publishing activity. It can be concluded that:

--Hungary's publishing productivity corresponds to the expected extent on the basis of its economic development, and indeed it even exceeds it somewhat.

--The quality of the publishing channels used is generally insufficient. Perhaps even today the longlasting effect of that international isolation of Hungarian science in the first half of the 1950's contributes to this. By developing a more effective publication strategy, publication in internationally respected and professionally high ranking magazines must be encouraged in all specialty areas.

--The effect of the Hungarian publications measurable by quotation generally approximates the international average; in two specialty areas (biology and mathematics), it even exceeds that.

--In several specialty areas the level of the publications is extremely polarized. Besides a small, internationally recognized "nucleus" there is a large number of totally unquoted publications.

I would like to speak about the economic effects of the results of the academy's research. On the scientific basis, it is only possible to give qualitative evaluation about these effects--whether they are direct or indirect. When I give a few numerical data, I will be doing so only in the interest of comparisons. According to our studies, the results of the academy's research that produce economic profit, manifest themselves most often in new products (types of plants, materials, component parts, or equipment), new technological processes and, especially recently, new software. The new plant types occupy an outstandingly important place among the new products; the special instruments and electronic equipment as well as the measurement data-collecting and testing and control systems are significant.

The studies showed that in recent years the research institutions themselves were forced to implement the utilization of research results in a number of cases, since for either objective or subjective reasons the enterprises made no effort toward rapid utilization. But in some research institutions, management recognized a demand for paying results; in order to satisfy it, they organized the production and sale of products to ensure utilization of the research results, partly by using the institution's capabilities and partly through the cooperation of cooperatives and enterprises. We must consider this activity commendable, even though it would have been more desirable if the results were implemented in production and sales organizations and if the research institutions could have shared in the profit. This activity is commendable because some research institutions furnished significant assistance through this to break down the walls between science and practice and contributed to making the results of research into useful end products.

The analyses have also pointed out that the users showed most interest in methods and equipment that provide technological control. One probable reason is that the use of such methods and equipment may result in significant quality improvements with relatively small capital investments. The other reason is that in most cases these methods provide the opportunity to automate the technological processes.

Even though in the introduction I cautioned myself against listing some selected examples, I will mention two examples for the practical use of the intertechnological control methods. One of them is the X-ray fluorescent analytical

equipment developed by the Atomic Nucleus Research Institute in Debrecen for the Szekesfehervar Factory Unit of the Csepel Metal Works. This makes it possible to analyze a sample taken from the nonferrous metal furnace in 8 to 9 minutes and provides the opportunity to change quickly the composition of the alloy in the furnace as needed. During the first 10 months of 1980, according to information provided by the user, the equipment was used to check and qualify several thousand tons of copper alloy.

The equipment developed by the Technological Physics Research Institute and operating in the Danubian Iron Works is also noteworthy. It measures the deviation of rolled steel sheets from flat and makes it possible to make adjustments on the rollers, which improves the quality of the sheets. During the trial run high-quality sheet production increased by 60 percent on the experimental roller line.

As long as I have started to list examples, I would like to mention a few results with truly significant economic effects. First, engineers of the KFKI [Central Research Institute of Physics] created various process control and regulating systems, using the computers that they had developed and a modern module system. They sold these for several hundred million forints to the Danube Coastal and to the Tisza Thermal Powerplants, the Kama Automobile Factory, the Almasfuzito Alumina Factory, enterprises of the National Petroleum and Gas Industry Trust, etc. But the direct profit in the institute's income is dwarfed by the economic results produced by the users.

Second, the creation and domestication of eight corn types, two autumn wheat types and one new barley type is a significant result from the Agricultural Research Institute in Martonvasar. Nothing demonstrates economic effect better than the fact that over a 5-year period Martonvasar types were harvested on an average of 18 percent of the country's wheat growing acreage; in 1981 this percentage surpassed 35 percent. At the same time the planting acreage of Martonvasar corn types decreased.

Third, the research results that commends the workers of the Veterinary Science Research Institute made it possible to defend against viral diseases that basically endanger the profitability of large-scale poultry production and develop the necessary vaccines.

I will quit giving examples, even though I could list a number of results of many other institutions. I will ask forgiveness from those institutions whose results I did not mention even though I could have possibly talked about results of even greater effect had I done the selecting a different way.

In some respects, the implemented patents reflect the economic effect of the research results; the patent fees provide information about the actual economic profit. During the report period, employees of the academy's research facilities made 347 domestic and 192 foreign discovery reports. The number of patents granted was 153 in this country and 74 abroad. One of the reasons for the difference is that invention increased significantly during the last two years, while at the same time, unfortunately, the processing time for the patent process did not decrease much; thus some of the reports made in the last two years

are still being processed. However, compared to similar data of the previous 5 years, these figures represent a noteworthy improvement. About 5.5 percent of the Hungarian patents applied for in this country come from the academy's research facilities.

The patents were used on 431 occasions, collected patent fees totaled about 110 million forints. Of this, 43 million forints were paid to the inventors. These numbers do not show significant economic effect. The academy's work aimed at the utilization of patents must be made more successful; more emphasis must be given to obtaining international patents for inventions that can also be sold abroad.

The three largest patent fees during the report period were paid for the following patents:

--process for postconstruction insulation of architectural and engineering creations, 3.41 million forints;

--process for increasing the water-resistance and rigidity of concretes and mortars made with the use of cement, 2.17 million forints; and

--data-processing equipment with at least one processing unit connected to a common data transfer channel and at least one memory unit, 1.68 million forints. Surprisingly these well-paying patents are far from the academy's fundamental research areas.

Even though the opportunity exists in Hungary for patenting new types of plants, no such reports have been submitted since there are conflicts between the state's type recognition and patenting. The consequence is that the new domestic types enjoy no protection aborad, which can provide the opportunity for numerous abuses and may also inflict economic damage.

Incomes derived from the sale of licenses are also low in the academy's institutions. In recent years, unfortunately no significant license sales have taken place, which means either that the academy's institutions were unable to offer licenses promising large economic profits to the enterprises or that the enterprises did not have the ability to purchase such licenses. It is worth considering, in any case, how we should change this situation, since several new scientific results of the academy are knocking on the gates of the enterprises in the areas of pharmaceutical research, plant protecting chemicals research, biotechnology, information technology and space exploration.

Due to their nature, the effects of research results in the social sciences manifest themselves in indirect, complex and at the same time different ways. No acceptable methods exist anywhere in the world for following the scientific informative effects. Therefore I was especially pleased that some of our noted researchers have undertaken developing methods to make the study of such effects easier. In developing these methods, attention must be paid to the analysis and evaluation of the most varied types of effects, since the effects of a dictionary, an atlas, a manual-type synthesis, a study serving to prepare for a decision or an outline of a new theoretical idea are all different. A research

result dealing with a uniquely Hungarian topic has a different effect from that of a scientific production without international boundaries. It is also obvious that the ideology-forming, consciousness-forming, culture-expanding, moral and aesthetic effects of the results of research in the social sciences will be delayed, therefore they can be studied only years later.

Preliminary information shows that broadly effective methodological results were born during the last 5 years in the areas of historical and philological research. The application of the comparative method has become universal.

Numerous important document collections, data repositories, bibliographies, dictionaries, atlases and other supplements--of great value especially for the future--have been prepared. The more accessible these become to professional circles, the greater their scientific and informative effects will be.

Monographs and the more significant studies fulfill an important role in strengthening the scientific-informative effect. Some period monographs in cultural history initiated important research projects, several monographs and studies attracted significant international interest. Reading the reviews, it can be concluded that the monographs dealing with the era of change in the world's economy, the theory describing and explaining shortage, the relationship between man and his life style, the connection between the center and periphery, the interrelationships between being undeveloped and the economic growth, etc.,have been recognized and started fruitful debates. These and other writings provide a realistic picture about the country's situation and analyze the difficulties, contradictions and, in a number of cases, the alternatives for further progress.

Experience shows that the results, methods and debate-causing conclusions of research in the social sciences favorably influence the public's thinking and exert an effect on education and public culture. For example, many consider favorably the effect that the academy's research as a whole in the linguistic sciences triggered in native tongue education and in preservation and development of the native language cultures. The volumes of the manual "Hungary's History" that have been published so far and sold in large numbers, are used successfully in training historians and in general university education. Great interest and expectations are being shown toward the volume that will show the time period following liberation. Historical interest is spreading increasingly not only in scientific but also in the public's thinking, which is heartening; credit for it is due in part to the results of the academy's historical research.

Studies to fulfill specific assignments have also been given room in recent years in the academy's social science research; some of these have been successfully concluded. It can also be considered gratifying that participation of the social science research facilities has increased in preparing and providing scientific foundations for the national decisions and the party's positions. The work on foundations for developing our price system and modernizing our production structure, and all the activity that our institutions performed in the interest of predicting the world economic processes and for the national economic planning, were particularly significant.

But we cannot be satisfied with the practical results of the research to modernize the public administration. In this area the government justly criticized the academy's research. However, the academy's research in legal sciences made a significant contribution to preparing various statutes. It is hoped that the measures will also help make public administration research more goal-oriented. The research on socialist enterprises--which, by the way, has produced many important results--is also laden with problems; its unique organizational framework and managing characteristics have only increased the difficulties.

In conclusion, even accepting the risk of an error, I would like to make two more general observations. First, in this recent time period perhaps it would have been desirable to strengthen the theoretical character, the theoretical requirements in the academy's social science research, and to provide greater encouragement for surpassing the customary descriptive approach, and for experiments to create theories. Even though noteworthy theoretical results were born in the area of economic science and historical science research, they did not always relate to the big questions of historical and social progress. This much cannot be said about the other specialty areas; what is especially regrettable is that this is not the situation in philosophy, which most requires generalization. However, the requirement of valuable theory-creating experiments is not in contradiction; on the contrary, it closely agrees with fulfilling the practically oriented research tasks to high standards. I am observing this so that we will not contrast the theoretical requirement and practical usefulness, willingly or unwillingly, with each other.

My other observation is related to the large syntheses, to the large collective jobs. Not to debate the significance of these for one instant, and acknowledging their necessity and their roles of creating something new, it is worth calling attention to the correct proportion of tasks and goals. Besides the systheses, and even within them, it is practical to support the development of new directions of research, the ones deriving from the internal logic of the social sciences as well as the ones oriented at social practice and also having theoretical requirements. Several initiatives have been taken in the last 2 years in the interest of this.

Reviewing the effects of the results of the academy's research in outlines and with varying emphasis, the question occurs. What can be said in summary about the quality of the achievements? First of all, quite outstanding performances blend with mediocrities in the average quality that may be called acceptable; the ratio of the latter is, unfortunately, larger than desirable. We must see in this not only an objective manifestation of the laws of statistics but also the effects that external and internal conditions have exerted on performance and the weaknesses of our own work.

However, the academy's scientific results achieved in the second half of the 1970's represent great value; their effects are in the process of developing and may play a significant role--indirectly, and in some cases also directly--in the domestic social, economic, and cultural growth. But so far they have not caused any real breakthroughs in the standards.

How Much Did the Academy's Research Cost?

I would not want to bore the general meeting's highly honored participants with an avalanche of numbers. In the interest of judging our opportunities with an approximate sense of proportion, I consider it necessary to mention a few key numbers.

According to the data of the Central Statistical Office [KSH], between 1976 and 1980 the country spent 94.1 billion forints on research, mainly on development. The share of the academy's research facilities was in round figures 11.5 billion forints from this, or 12.3 percent. However, the national budget contributed only 4.8 billion (42 percent) of this 11.5 billion forints; the larger part, 6.7 billion forints, came from incomes for fulfilling research and development contracts. During the 5 years, from the 11.5 billion forints we spent

2.3 billion forints	for wage-type expenditures
2.8 billion forints	for investment purposes
2.9 billion forints	for direct research expenses
3.5 billion forints	for miscellaneous indirect expenses.

It is difficult to establish accurately the shares of the individual scientific branches. It appears from our studies that the share of the technological, agricultural and medical sciences is relatively low, even though the academy does not have the primary responsibility for their development. Jointly with our partners, we must examine the extent and conditions for the desirable modification of the proportions.

The academy's expenses for research increased by an average of 10 percent per year between 1976 and 1980. This increase only partially compensated the approximately 14 percent per year increase in operating costs accompanying the rise in price levels.

The full sum of the academy's actual expenses was 14.7 billion forints. With the 3.2 billion over the 11.5 billion, we covered the costs of scientific qualification, other budgetary organs not engaged in research, the library, vacation homes, etc.

In order to judge the actual weight of financial resources, it is necessary to furnish the research working time base of the academy between 1976 and 1980. The research facilities of the academy used, in round figures, 14,600 researcher years, which represented the working time base of an average of 2,920 researchers. An average of 788,000 forints is spent per research year of the working time base; in the social sciences this is only 158,000 forint.

These numbers can receive the proper weight if we compare them with the international data. This is a difficult task, which cannot be solved precisely; yet the comparison is justified even if only on the basis of approximate estimates. Considering the annual averages of the dollar exchange rates, our expenditures over the 5 years are equivalent to about $300 to $400 million. According to this, the amount spent per researcher in Austria is 4 1/2 times, in Sweden and in the FRG 5 times, in France 6 times, and in Czechoslovakia 2 times the academy's expenditures. No matter how inaccurate these ratios, we must increase

the expenditures per researcher, even if this can be accomplished only at the cost of decreasing the quality improvements in the number of researchers. Otherwise we cannot stand our ground in international competition.

In order to characterize the full manpower inventory of the academy's research facilities, at the end of 1980 there were about 3,100 researchers, 2,000 research assistants and 3,500 workers listed under other job categories, for total employment of about 8,600.

The average age of the researchers increased from 38 years in 1976 to 39.6 years in 1980. The age of 24 percent of the researchers is still under 30. About 920 people have scientific degrees, 30 percent of the total research manpower.

Between 1976 and 1980, only 183 researchers participated regularly in the university's educational work. It is characteristic of the pseudomobility of researchers that during the 5 years about 550 researchers changed to new, predominately research jobs; about 1,000 entered the academy's employment.

During the last 5 years the wages and income of the academy's researchers unfavorably compare similar strata. The social importance of scientific work--and specialized knowledge and education--is not recognized everywhere; thus, it is not even appreciated, even though there is a whole series of national decisions and party resolutions dealing with the outstanding significance of creative scientific work.

In addition to the good idea and careful work, the success of research depends basically on the level of the technological equipment. The modernity of research equipment, of the analytical, measuring, examining, and preparatory instruments, and of the data-collecting and -processing systems; the extent of automation and computerization, etc., play definitive roles in ensuring the success of research work. What was the change in the technical equipment of the academy's research between 1976 and 1980?

In 1976 the gross value of the academy's research equipment inventory was 2.4 billion forints; its net value was 1.4 billion forints. Thus, the degree of obsolescence was 58 percent, which unfortunately represented unfavorable starting conditions. The actual situation is worse than the numbers because the obsolescence index had to be calculated with an unrealistically low 6 percent amortization key. In 1980 the gross value of the equipment inventory increased to 4.3 billion forints and its net value to 2.3 billion forints, the degree of obsolescence changed to 53 percent. But this 5 percent decrease in obsolescence did not bring, and could not have brought, a significant change. Perhaps the computer availability has improved somewhat with the purchase of the IBM 3031 machine and with the startup of several small computers. Between 1970 [sic] and 1980, 37 significant purchases of research equipment were made; this can be considered a nice performance under the deteriorating economic conditions. The purchases can be justified even with today's outlook, since they created better and more modern circumstances for scientific work. About 35 percent of the sum spent on machinery and instrument investments served directly the research projects in progess in the main resaerch directions. Based on studies it can be concluded that in essence the investments implemented during the plan's time period have prevented unjustifiable "white spots" from developing in the research equipment supply.

Utilization of large-scale reserch equipment is not uniform. What is even more important than formal level of utilization is, for what and with what results the researchers use the expensive research equipment. The answer to this question can be provided by thorough evaluation of the research results at the research facility.

What Did International Scientific Cooperation Produce?

Today it is common to talk about the significance of international scientific relations in research work. Therefore, instead of repeating the theoretical considerations, I would like to show only a few data and a conclusion or two about the international relations of the time period between 1976 and 1980.

In 5 years our academy spent 150 million forints on international relationships; research institutions earned 20 percent of this, 30 million forints, with their own incomes. A total of about 19,600 trips abroad were made, 65 percent to socialist and 35 percent to capitalist countries. Unfortunately only a small number, 590 trips, lasted more than 3 months. What is even sadder, a smaller ratio of even these were made to the socialist countries. The amount of travel costs per researcher increased significantly during the last time period, from 7,500 forints to 12,300 forints. This represents an increase of 63 percent.

The results of international scientific cooperation must decisively manifest themselves in research work. The effect of the relationships developed during the cooperation is much broader in scope than this: they may promote economic cooperation, contribute to improving the conditions of the political dialog and to strengthening mutual trust. The domestic research, and within this, the academy's research may be tied with many, repeatedly renewed threads to the international scientific life and to the noted foreign work shops of research work. In the last time period our relationships with Soviet science and with the creative scientific work shops of the socialist countries played an outstanding role in these relationships. It is unnecessary to emphasize that in the future we must reinforce these relationships, we must take better advantage of the potential opportunities in them, we must provide increasing support to the successful cooperative projects and be more courageous in eliminating nonproductive formal activity. In the case of mutual advantages--considering the experience gained in recent years--the scientific institutions of the nonsocialist countries must also be developed further.

Our international political interests require that the scientific relationships should not feel, or feel only slightly, the fluctuations of the political relationships. Scientific relationships can be built up only slowly; they can be broken and ruined that much quicker. The relative constancy of scientific relations may also help in the reorganization of political relationships, which may become necessary from time to time.

Between 1976 and 1980, there was cooperation on about 860 research topics between the academy's domestic research facilities and foreign research facilities. This number does not say much by itself. If--relying on expert opinions--we add that the efficiency of cooperation was good in only about 60 topics, and in nearly 340 topics there were no results or the level of the results achieved was low, then the fact that on 460 topics acceptable mediocre work was being done,

does not give us the right to make complimentary statements about the average success of international cooperation. Of course, everyone can cite a good example or two but this does not change the situation.

Experience in basic research shows that the outstanding results were generally born in those topics in which the researchers cooperating had common interests, which the researchers themselves initiated, and which at the same time also received encouragement and support from the management. Some of these personally initiated working relationships later became recognized and highly important cooperative projects and served well our fundamental research policy interests.

In summary, the international activity of the academy's research facilities grew significantly in size and extent during the 5 years, but in an uneven manner in terms of its success. The initiative ability and independence of the institutions increased but there was no adequate coordination and sense of proportion realistically considering the possibilities. The material supply deteriorated significantly, and even in spite of numerous earlier positions taken, the international scientific cooperation and its handling did not become internal, organic components of the research activity.

About Management

A long list of contradictory opinions could be given about the manageability of research and about the merits and faults of actual management. Due to time, I would like to touch upon just a few questions.

The experiences of recent years have repeatedly proven the conviction professed by many people that discovery of the unknown phenomena of reality, the laws that govern them and the great discoveries cannot be directed in the everyday sense of the word. The new and unusual thoughts, the daring theories and the discoveries that are surprising in the beginning but later appear annoyingly simple, are not born from directives but in workshops of science that have a good atmosphere and unfortunately even there rarely. Therefore I am perhaps not making an error in stating that the basic research projects that--if we are sufficiently patient--may once in a great while surprise us with pearls, cannot be directed in the ordinary sense, only influenced. They can be influenced by the debates, analyses and suggestions that direct the attention of the researchers to the movements in the international front lines of science and to the interconnections that cannot be seen well on the horizon of the narrower specialty field. Of course, they can be influenced with the material and financial means, which, when granted, expanded, or withheld, will directly or indirectly affect the conditions of research work.

When influencing with material means, in granting or withholding support, we must consider the results of past work as the basic criterion. If it is outstanding, this is an encouraging recommendation for the future. However, successful work is often preceded by unsuccessful work; therefore there is a need for patience and sensible acceptance of risks in the organizations responsible for management.

Intensive support to basic research would be especially important in several areas. We must list modern biology among these areas, which is important not only to health care, agriculture and the pharmaceutical and plant-protecting chemical industries but is increasingly becoming a strategic factor of the entire economy. It is necessary to face the expected effects free of illusion, to estimate the possible results without exaggerations and to concentrate a portion of our resources on these research projects. The micromaterials science laying down the foundations for consciously regulating the characteristics of micromaterial quantities promises to become an area of outstanding importance. This creates the possibility of performing various, primarily logical, functions in amazingly small material quantities and is expected to be preparing a new revolution in microelectronics. The systems-approach basic research projects serving to discover the condition changes, dynamic behavior and sensitivity points of ecosystems, are significant. Within basic research, certain theoretical research projects deserve significant attention. It is general knowledge that the Hungarian researchers produced internationally noteworthy results in mathematics, theoretical physics, the theoretical branches of chemistry, economics, sociology--I could keep listing them. This must encourage us to increase support in these areas. The general and special importance of the social sciences also demands particular attention and support in shaping our future, especially for basic research in the interdisciplinary social sciences. Naturally this listing cannot claim to be complete and rather serves to illustrate the possible directions.

The job of the next time period will be for us to outline the most important directions of basic research to be cultivated in this country, or at least what is considered such today, with the active cooperation of those skilled in this and on the basis of responsible positions taken by the scientific bodies, in accordance with the new requirements of the new times.

The internal direction of basic research is determined over the longer range by the social driving forces of the work performed to discover unknown phenomena and laws and to create new ideas and theories. These driving forces sooner or later exert their effects. In the area of basic research the primary job of research management is to create the conditions in harmony with the realities for the optimum operation of these driving forces. This kind of direction can only be deeply democratic because preparation of the decisions that represent influence can be accomplished only in creative debates, based on the responsible positions taken by competent scientific collectives.

The general secretary of the Hungarian Academy of Sciences is in the fortunate position of being able to rely far-reachingly on the opinion of the scientific bodies as well as of the members of the academy before making these decisions. Perhaps it is not be completely one-sided statement that in the recent time period the relationship has strengthened and improved between the scientific bodies and the academy's organs responsible to the national government for directing the research. In order to solve the increasingly difficult problems of the present and of the future, there is a great need to foster this relationship, and to have unity based on theoretical debates; however, we will have much to do to create and strengthen this over and over again.

Naturally a significant portion of the academy's research is also closely related to the actual problems of economic and social growth. In these research areas direction must face much more closely defined tasks. The decisive question here is, How can the directing help and organize the correct selection of research goals and how can it help society learn the achieved results quickly? Analyzing the experience of the recent time period, it can be concluded that the academy's research management participated with increasing efficiency in coordinating the planning process but it has still neglected to influence the planning work with prognoses and concepts. It appears that the statement is again justified, that we have not succeeded in overcoming the elements of formality in research planning; the changes--in most cases, deterioration--in the material and personnel conditions needed to achieve the plan's goals were not followed by modification of plans or flexible selection of goals. We can report improving work in organizing and controlling the implementation of the plans, credit is due to, among other things, the active cooperation of the individual corporate organs and the scientific committees and to the reasonable use of continuous reporting. We did not succeed, however, in developing a system of criteria which bureaucracy and subjectivism in judging the performances could be significantly decreased. It is possible that such a system of criteria is difficult or totally impossible to develop, but a final judgment cannot yet be pronounced on the basis of efforts to date. The outlines of a possible path are perhaps indicated by the scientific study of the effects triggered by the research results. But much work still has to be done on this; the active cooperation of the researchers is needed.

A basic question in connection with all directing, including directing the academy's research, is, What are the tools with which directing can be accomplished, and to what extent can they be used? Without trying to be complete, I would like to mention a few of these tools. They are, for example:

--distribution of the investment goods;

--manpower modification (increase or decrease);

--distribution of the budgetary support;

--support of competitive entries from the Central Research Fund;

--regulation (expansion, tightening) of the participation in international cooperation;

--evaluating the activity of the leaders under one's sphere of authority;

--issuing directives, regulations, etc.

Besides these tools, other--relatively less effective--methods are also available for directing, such as:

--defining the guiding principles of planning;

--working out analyses, prognoses, and concepts worked out, distributing them, and having the positions defined in them accepted;

--publicly and democratically evaluating the research results;

--supporting tl . significant initiatives by researchers;

--developing democratism based on the acceptance of responsibility and extending the right to a voice in decisions.

We have conducted careful studies in order to learn the extent of freedom for the academy's research management in using these tools. First, I want to make some remarks about the role of financial tools in the academy's research management. In recent years the shortage of means that has become constant, forced us to make a number of predetermining decisions, which made any significant path modifications almost impossible. Each year was subjected to the pressures of the burdens, the well-considered or ill-considered undertakings of the previous years; that in itself also created burdens on the following years. Because of this, then, with the most effective tool of direction, with the tool of financial influence until now only disturbing effects could be achieved. The high degree of sensitivity of the research network increased the difficulty of implementing the necessary modifications; the failure to recognize the real difficulties and the already mentioned lack of resources only increased it.

This situation cannot be preserved. We must take definite measures in the interest of being able to make our decisions about the use of the financial tools not as prisoners of past decisions but increasingly--even if this means accepting conflicts--with a certain degree of freedom of the opportunities.

Even though the competitive entries financable from the Central Research Fund offered a modest opportunity for new initiatives even before the real progress was created by the fact that mainly the major research institutions--taking advantage of the benefits of research under contract--have embarked on the path of enterprising. By doing so, they have to a certain extent allowed the directing effect of the needs of the contracting customers justifiably to prevail.

By the way, the number showing that between 1976 and 1980, 6.7 billion forints, or 58 percent of the incomes related to the academy's research and development activity, was derived from the enterprises, convincingly illustrates this situation. The Central Research Fund can also thank this successful enterprising activity for its existence.

In reviewing the process developed in recent years, the enterprising desire of the academy's research facilities should be strengthened; it must be made possible for them to reach full or partial financial independence; new formats must also be sought for this. This way perhaps some of the budtetary assistance could become better usable to support partly the basic research and partly the large and comprehensive programs. Through this it would be possible to decrease the extent of determination that exists in the utilization of the financial means.

As far as the other tools and methods of direction are concerned, we are far from having exploited the existing opportunities. The situation analyzing studies, prognoses and concepts of the corporate organs, scientific committees

and outside experts must be given a greater role in the planning work of the research facilities. We must also make better use of the studies that the OMFB [National Technical Development Committee] ordered, and debated. Directing the academy's research must approach the economic and social crisis and at the same time research itself; its helping, supporting, coordinating, contact-creating and evaluating functions must prevail better. Only this way can it fulfill its great and honorable job of serving science.

About the Jobs That Need To Be Done

In accordance with my decision I talked about the past, not because I have forgotten Szechenyi's words--"The past has fallen from our might, [but] we are masters of the future"--but because I wanted to direct attention to the tasks of the future. I do not want to speak in detail about these tasks but would like only to summarize those features and requirements considered most important, which characterize these tasks.

The significant but not exactly foreseeable changes expected for the 1980's further increase the role of the socioeconomic factors in scientific research, and vice versa. Active participation of science and research is becoming increasingly indispensable in finding new paths of socioeconomic growth and in developing unavoidably necessary renewal.

In accordance with this, the academy's research must give preference to those highly significant and comprehensive socioeconomic problems of key importance from the viewpoint of the domestic economic growth and naturally of the development of the entire society. In working out their alternative solutions, the social scientific, technological, agricultural, health care and natural science research facilities must cooperate in a better and more organized manner. This requires that the management of the academy's research help break down the dividing walls built of unique but intolerable local interests that hinder the cooperative work, by modifying the interest circumstances and increase the tolerance capability to help bear the sensible and necessary changes.

An important research policy task of the 1980's is to adjust the structure, organization and method of operation of the academy's research to the new conditions on the basis of carefully analyzing the human factors that motivate the interests, in order to increasing the social usefulness of science.

Considering the expected burdens of the 1980's, to a significant extent we can implement the increase of performances and quality by the reserves concealed in our intellectual resources and from the potential opportunities of the new interventions. This requires, among other things, lively basic research, which provides real values, searching out and intensively supporting the talents, and a scientific atmosphere that encourages finding new truths. The academy's research policy must start from the realization that basic research is the "lungs" of the entire scientific organization, which must breathe freely and that basic research is indispensable for keeping the innovative processes alive, and to improving constantly the quality of the intellectual background and scientific thinking. At the same time this research policy must also know that society expects a concrete profit from the scientific efforts. Therefore we must encourage, aid and organize the practically oriented research undertakings of the academy's research facilities.

The 1980's will demand much from the workers of science, under relatively severe conditions. It is important that the judging and evaluation of the performances be more thorough and outspoken than in the past. Scientifically based qualifying methods and multifaceted and differentiated evaluation of the effects triggered by the results of research are needed for this, because qualification cannot remain without consequences. The academy's research management must promote polarization; those who produce outstanding results receive increased support and those who produce illusions receive rejection. Support by scientific opinion and the active assistance of those who can recognize the real scientific values is needed for this. Unavoidable difficulties and our intentions of defending and increasing what we have, require outstanding work; perhaps we will even be able to produce better than the average.

Although talk has run long, I was unable to talk about many things about which I should have talked. I have only touched upon the expected problems and hopes of the 1980's, but I allowed for some predictions of the 1980's as the decade of great efforts and significant changes, which must bring about the construction of new and more efficient development paths for the success of our socialist country and people.

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CSO: 2502/89

COMPETITION FOR DESIGN OF ELECTRONIC CIRCUITRY

Budapest MUSZAKI ELET in Hungarian 2 Sep 82 p 2

[Excerpts] A competition for development of basic type GATE-ARRAY and ULA circuitry compatible with Hungarian technological potential has been announced by the Central Electronics Development Office of the Hungarian Communications Engineering Association and the Government Committee for Microelectronics. In the judgment of entries, the following aspects will be considered in addition to the general technical-economic level of the result: TTL/CMOS compatibility, rentability of production (ratio of complexity to output), speed attained through the selected technology, the degree to which concrete applications have been worked out.

Entries must include detailed technical description and specifications of the device; measurements which verify specification data; at least 10 mask steps permitting estimation of yields and containing 10 fully metallized incomplete circuits; all documentation and descriptions needed for reproducing the masks adapted to the requirement of the technology selected.

Entries must be accompanied by a sealed envelope containing the name, or in case of a team, the names of the entrants. Entries which are rejected will be destroyed. Information included with the entry will be treated as an official secret. Should the entry be accepted, conditions needed for its realization will be created. There are to be one or two first prizes of 80,000 forints and two or three prizes of 50,000 forints each. Works suitable for realization and the right to do so will be purchased under separately negotiated contracts.

The deadline for submitting entries is 30 April 1983.

CSO: 2502/1

BRIEFS

NEW, SMALL COMPUTER--Assembly of a new small computer developed by the LSI ATSZ [LSI Alkalmazastechnikai Szolgalat: LSI Applications Technology Service] has begun on a cottage industry basis at the New Life agricultural producer cooperative with the assistance of electrical engineers and electricians. The typewriter-sized computer can be used for billing, office administration, teaching and in medical technology. The basic machine costs only 34,000 forints and is called the Mickey-80. Its success is indicated by the fact that the first 25 units of its zero series have already been bought by hospitals, schools and plants. Production of 300 such small computers is planned for the near future. The basic user software is prepared by the LSI ATSZ; prices are set on the basis of competitive bidding. [Text] [Budapest SZAMITASTECHNIKA in Hungarian Jul-Aug 82 p 1]

CSO: 2502/3

COMPUTER SYSTEMS DEVELOPMENT, REORGANIZATION OUTLINED

CAMAC Computer System

Warsaw PRZEGLAD TECHNICZNY in Polish No 5, 11 Jul 82 pp 26-27

[Docent Dr Eng Roman Trechcinski, director of the IBJ [Institute of Nuclear Research] Nuclear Electronic Bureua; Magister Eng Miroslaw Herman, technical director of the POLON Association of Nuclear Equipment Plants; and Magister Eng Czeslaw Dryja, deputy director of technical affairs at the ZAE [Electronic Apparatus Plant], interviewed by Mieczyslaw Komuda; date and place not specified]

[Text] CAMAC--Computer Automated Measurement and Control. Originally it was developed as an interface devise between an automated object and any computer. However, after large-scale integrated circuits were introduced, especially in microprocessors, the intelligence contained previously in computers was transferred to the system. Thus the system in effect became a universal digital computer, that is, a computer that can control any object.

[Question] KODAK's advertisement at the turn of the decade urged buyers; "You push the button, we do the rest." Is CAMAC an example of the materialization of this blustering advertisement?

[Trechcinski] Of course, modular digital systems are used extensively to automate production processes. After all, many such systems have emerged. I suppose that there have been hundreds of them, but one of them, CAMAC, triumphed and achieved a world standard level. The ESONE (European Standard of Nuclear Electronics) Committee developed the CAMAC system. ESONE is an unofficial organization of laboratories engaged in, literally speaking, atomics. It is unofficial because it is a voluntary association of laboratories that arose and functions outside the United Nations or any other large international organization.

[Question] Of what time period are we speaking?

[Trechcinski] ESONE began in the 1963-1964 period. The first document concerning CAMAC, called "4100," was issued in 1969.

[Question] Did ESONE commend the system or did it develop the idea?

[Trechcinski] It developed the idea. Perhaps CAMAC may not have been better than other systems that were developed at the same time, but it was based on the organization of that committee. The organization did not require licensing or a contribution, but it offered the free use of its developments which cost several scores of millions of dollars. Basic standardization documents were developed. Those who want to take advantage of the system receive all that free.

[Question] Where did this excellent information come from?

[Trechcinski] I am a member of the ESONE board, the superior organ, the so-called Executive Committee Group.

[Question] What other socialist countries beside Poland belong to ESONE?

[Trechcinski] Yugoslavia, Romania, Hungary, the GDR and the Association of Institutes of Nuclear Research at Dubna are members. The only condition stipulated in the statute is that an Esone member must be a nonprofit organization. There are no nonprofit limitations.

[Question] The year was 1964. Did Poland have its hand on the pulse from the very beginning?

[Trechcinski] We found out about the system somewhere around 1968. Four systems were functioning in Poland at that time in atomics alone. It was a monstrous production situation. Thus a struggle over CAMAC began. Supporters and opponents of the system appeared. It was extremely difficult to come to a common agreement and to obtain government approval to liquidate all existing systems and concentrate exclusively on CAMAC. We finally obtained such agreement in December 1969.

[Question] At that time, what was the state of computer technology in Poland?

[Trechcinski] It was barely the beginning. There were few computers. The K-202 was the most suitable for CAMAC. Concerning electronics, it was the era of transistors.

[Herman] It should be remembered that at the POLON ZAE vacuum-tube apparatus were still being produced; a modular vacuum-tube system is totally unsuitable for operation with computers.

[Trechcinski] Thanks to the introduction of CAMAC, we obtained that apparatus.

[Question] But how did that introduction of CAMAC come about?

[Trechcinski] We offered a proposal to ESONE which was accepted; then we obtained all the basic documents. The production of CAMAC modules was initiated sometime in 1973 by the POLON ZAE and the ZUP [Plant for Industrial Equipment] in Krakow. In 1972, we developed a module which interfaced with

the K-202. When K-202 production ceased, we had to develop our own design. It was then that the first automatic processor, a CAMAC module, appeared as a stand-alone computer. The series production, though small, continued for many years. Then we built MERA 300 interfaces based on the so-called MOMIK computer, followed by interfaces with the ODRA 1325. MERA 400 interfaces also were developed. SM [minicomputer system] and MERA 60 series interfaces are being produced. Of course, CAMAC interfaces with all Western computers.

During the 1974-1980 period, the ZAE was preparing for the production of equipment for the CAMAC system; this equipment is now in production. These are multifunction units which enable several hundred expanded systems to be created.

[Question] Let us say something about the application.

[Dryja] The most spectacular example of a CAMAC application is the Belchatow Electric Power Plant computer system, a system that gathers data from the power unit (about 2,500 different analog and digital signals). It gathers information, shapes it in accordance with the complex technoloyg of the unit's operation, presents the information to the controller and records it in memory; thus it is possible to recreate the prebreakdown status of the unit. This system permits economical operation of the 360-MW unit. We have an agreement which defines precisely the conditions for delivering such systems for all 12 units at the Belchatow Electric Power Plant.

[Question] Is the application of CAMAC more limited?

[Dryja] Colleagues from the COTM [Central Institute of Medical Technology] built a system to monitor childbirth activity using our units.

[Trechcinski] In a few days my daughter will be giving birth there. I will be a CAMAC grandfather, so to say.

[Dryja] Between these two most spectacular examples of applications, there is an extensive range of industrial applications, that is, small, autonomous systems using minicomputers. Some examples? A console to measure and control transformer parameters at the Skierniewice Plant; investigation of turbine blades at the Zamech Wind Tunnel; systems at stations to investigate internal combustion machines, and so on. All these applications are examples outside nuclear technology. I would like to emphasize this strongly because I would bore the readers by giving examples of applications in this actual field. It is enough to mention the spectrometers having different configurations and applications or even the small stations to receive and process data.

[Herman] The system designed to aid the operation of the 360-MW energy unit is a large system. It costs upward of 26-30 million zlotys. It is the most extensive system built on a semiseries scale (12 systems are a series production). It is the most modern CAMAC design with the latest generation of subassemblies.

[Question] What is the scale of production?

[Dryja] We are producing about 10,000 devices in 50-60 assortments. This permits the construction of at least several hundred systems annually. For example, we supply 200-300 systems annually to the USSR.

[Question] Are we the only producer of CAMAC units among the socialist countries?

[Dryja] No. But we are the largest producer. Hungary, Czechoslovakia and the USSR produce small amounts of CAMAC equipment.

[Question] How modern is your equipment?

[Dryja] It is difficult to evaluate oneself. We are almost a monopoly in the CEMA market. In fact, we impose a certain design style. Some designs, for example, those included in the Belchatow system, are comparable with Western designs.

[Question] Does CAMAC have a future?

[Trechcinski] When such a type of apparatus is used for automation, then the average profit resulting from such applications approached 400 percent of the value of the apparatus. Thus it is not surprising that the trend in applying CAMAC systems to automation is very strong. The many new systems that continue to emerge demonstrate this. Literally each year names of new modular systems appear. It appears that the future of this type of apparatus is guaranteed, and for many years at that. According to Western estimates, CAMAC itself will reach its peak more or less during the mid-1980's. We are not worried about demand for our production up to 1990.

[Question] What are the prospects for production?

[Trechcinski] If we are going to produce the CAMAC in plants now belonging to the PAA [State Atomics Agency], then we cannot count on any significant increase in the scale of production.

[Question] Will it be necessary to increase production?

[Trechcinski] There is no problem in Poland with markets. I agree that currently we are not utilizing all the capabilities the system provides. Our activity is based primarily on the sale of units in bulk. Considering total sales, only a small percent end up in complete systems. Many more CAMACs could be sold if the production base were adequate.

[Herman] I believe otherwise. In the next 2 or 3 years the possibility of increasing CAMAC sales in the domestic market will be minimal. There is an economic crisis. Industrial plants and especially scientific institutions are counting every grosz and they will be unwilling to invest. It appears that only sometime around the end of 1983 will a new type calaculation start in Poland: that it will be profitable to automate production. Today the need to give out money for CAMAC works against it.

[Question] Then how will you manage over the next 2-3 years?

[Herman] Starting in 1974 with CAMAC in the Soviet market, we estimated the absorptive power of this market at 6 million rubles annually. Today our production sales there are 10-12 million rubles, and we know that we could have sales of 20 million. In a word, there is a market and production can be increased.

[Question] How many people in Poland are involved with CAMAC?

[Dryja] About 1,000 people are employed directly in production, and several hundred people are involved in development work.

[Question] Will the reform help or hinder your plan?

[Dryja] Let us above all remember the doubts. For the time being, the reform will not produce any obvious advantages for us. It seems that a plant that exports over 80 percent of its production should have resources to develop these products technically to say nothing about the technical development of the plant itself. At the moment, these resources are a bit small, and additional funds must be taken from the profit pool.

[Herman] Our export index is high and, in association with this, in the framework of the reform we are approaching the top income tax of 90 percent. In other words, 90 percent of our export profits are paid to the state treasury. Before the reform, the export tax was 80 percent.

[Trechcinski] At the moment we actually lack money for new developments, not only for scientific-research work but even for design work and system development work. This year we have had much difficulty finding financing sources. Financing limitations are quite significant, as much as 50 percent. Meanwhile, even though CAMAC will continue to function for many years, we must think about its successor right now. In principle, 1982 will be a year which we will dedicate to observing carefully that which is going on in the world. We expect that some sort of successive world standard will appear. When this happens, we must invest at once, otherwise we will not maintain our markets, even the CEMA market.

New Association of Computer Enterprises

Warsaw PRZEGLAD TECHNICZNY in Polish No 4, 4 Jul 82 p 26

[Article: "A New Association of ZETO [Main Center of Electronic Computer Euqipment] Enterprises"]

[Text] On 23 April 1982 the directors of the Center for Information Science Design and Applications, the Informatio Technical Trade Enterprise, headquartered in Warsaw, and the directors of the ZETO plants in Bialystok, Bydgoszcz, Gdansk, Katowice, Kielce, Koszalin, Krakow, Jelenia Gora, Lublin, Olsztyn, Poznan, Rzeszow, Szczecin, Walbrzych, Wroclaw and Zielona Gora signed an agreement uniting the enterprises. ZETO Lodz is not included

because its retiring director did not want to make such an important decision for his successor.

The association will be of a coordinative nature, and its primary task is to organize and coordinate activities beyond the equipment, financial and personnel capabilities of the individual enterprises, and also to act in matters that are common to all association members regarding the authorities and the biggest customers (NBP [Polish National Bank] and ZUS [Social Security Agency]). The association will facilitate the conduct of joint research and development work, the exchange of software, the undertaking of joint investment projects and the determination of prices, as well as the forming of program teams to resolve complex and important tasks.

Fears are often being expressed that the association will degenerate into a creature of the old type associations. The Interim Statute on the Association of ZETO Enterprises contains many conditions guaranteeing the independence of the individual enterprises. The statute states that "the association does not have the right to direct or control association members." The association which requires a financial commitment from the enterprises, is voluntary. A lack of agreement and the noncontribution of payments merely signifies the exclusion of the association member from a given undertaking. The introduction of important changes in the Statute of Association permits members to leave the association without a termination period.

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